Defense Information Systems Agency
Department of Defense

Spectrum and E3 Implications in Commercial Item Acquisition

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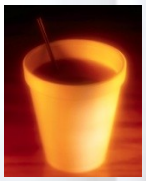
Date XX, 2009

Please Stop Us Anytime!

Breaks · Questions · Hidden Slides ·



Contact Information

Purpose

- **Provide overview of the Electromagnetic Environmental Effects (E3) and Spectrum Supportability (SS) implications and technical issues associated with use of Commercial Items and Non-Developmental Items (CI/NDI)**
- **Provide an overview of commercial Electromagnetic Compatibility (EMC) certification processes**
- **Provide a general comparison of major commercial Electromagnetic Interference (EMI) standards to MIL-STD-461**
- **Provide guidance on how to assess and manage the EMC risk of using Commercial and Non-Development Items in weapon system acquisitions**

Seminar Overview

- **Use of CI/NDI**
  - What are Commercial Items?
  - Why Use Commercial Equipment?
- **Examples of EMI/Spectrum Problems**
- **Definitions**
- **Big Picture**
- **Commercial Items and Acquisition Policy**
  - Military and Commercial EMI Standards
  - DoD Acquisition Process Overview
- **US Commercial EMI Standards – FCC**
- **EU Commercial EMI Standards**
- **Spectrum Supportability and CI/NDI**
- **Program Office Guidelines for the Use of CI/NDI**

Joint Vision 2020

Dedicated individuals and innovative organizations transforming the joint force for the 21st Century to achieve **full spectrum dominance** :

- persuasive in peace
- decisive in war
- preeminent in any form of conflict

http://www.dtic.mil/jointvision/jvpub2.ht

Information Superiority

- **Information Superiority Required**
  - "The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying the adversary's ability to do the same."

- **Critical Medium: Electromagnetic Spectrum**

SPECTRUM DOMINANCE

Commercial Items and Non-Developmental Items (CI/NDI)

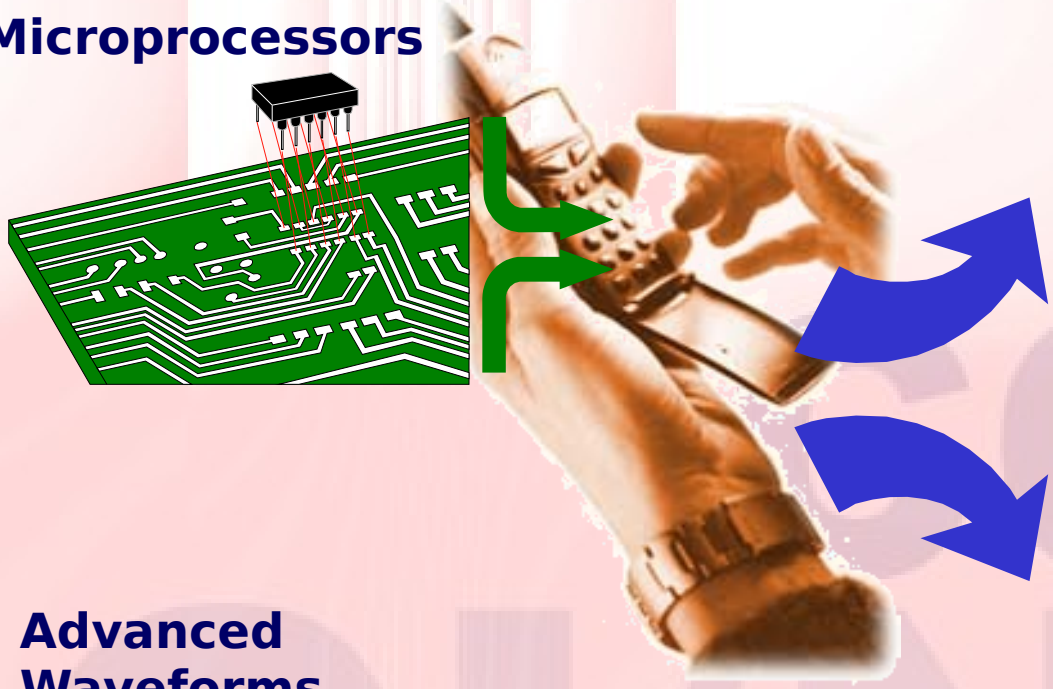
- Use of CI/NDI Is Growing
- Can be a Cost Effective Alternative
- Lower Life-Cycle Cost; Takes Advantage of Latest Technology
- More Rapid Deployment of a Proven Capability
- Increased Competition and Broader Industrial Base

Commercial Off-The-Shelf (COTS)

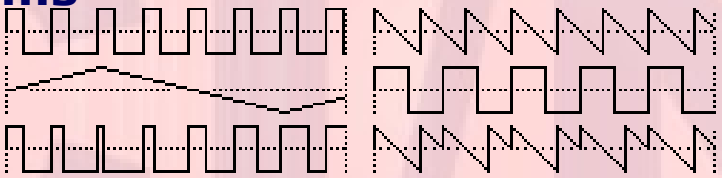
- COTS seen as a “favored” solution
  - Development costs decreased/Reasonable alternative
- Problems
  - Frequency bands not similar internationally
  - Government use of Non-Government bands is restricted
  - Equipment cannot be modified in ANY WAY (without recertification)

Why Use COTS?
To *Leverage* Technology

Embedded Microprocessors



Advanced Waveforms



Opportunities in Effective Spectrum Use:

- **Variable/Wide Bandwidth**
- **Automatic Frequency Selection**
- **Non-standard Waveforms**
- **COTS**

- **Increased Capacity**
- **Automated Frequency Reuse**
- **Adaptability**
- **Resistance to Jamming**

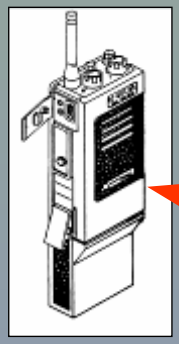
Problems When Using COTS Equipment

- **Not Designed For the Military Electromagnetic Environment**
- **Design/Standards**
  - No Receiver And Minimal Immunity Standards For Commercial Equipment
  - Commercial Emission Standards Too Lenient
- **Spectrum Usage**
  - Military Operating Commercial Equipment In Non-approved Band
  - Loss of Spectrum
  - Operations Close to Land
  - CI Must Comply With SC Process If Operated By Military

Why Do We Care?

Combat Systems to COTS EMI

Can't Communicate



BG Cellular *

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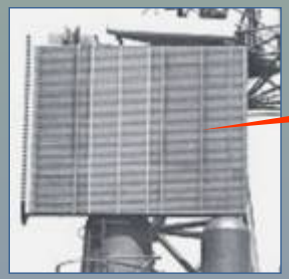
COTS Equipment **NOT** Designed or Tested for Tactical EME

Knocks Off-Air



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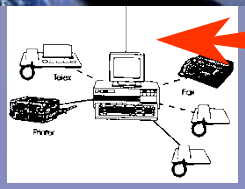
CHALLENGE ATHENA *

Prevents Data Transmissions **



INMARSAT *

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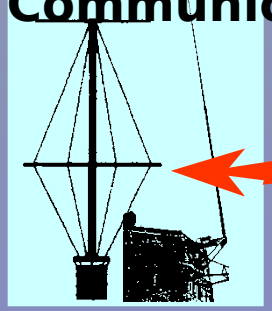
Degraded Communications



HF/UHF Rcvrs

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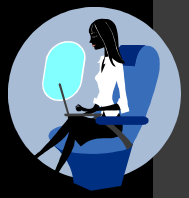
Commercial Equipment Solution Available (Not Installed On All Ships)

Examples of EMI Problems Involving Commercial Items

Automobile and Aircraft Anti-Lock Braking Systems (ABS)



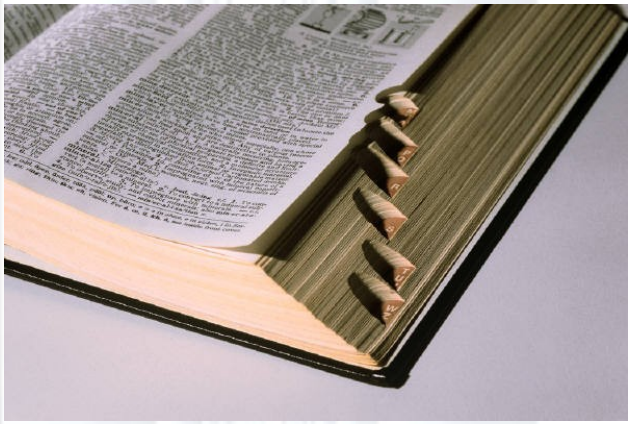
Airline Passenger Carry-on Devices (Computers, Radios, Cellular Phones, Etc)

Medical Equipment – wireless heart rate monitors, defibrillators

Quality Of Life Equipment (i.e. ATMs, Cell Phones, TV, Radio, etc.)

Runaway Wheelchairs

Definitions



COTS
CI/NDI

CI/NDI

- **CI: an article used for non-Government purposes and has:**
  - Been sold, leased, or licensed to the general public,
  - Been offered for sale, lease, or license to the general public, or
  - Evolved through advances in technology or performance and is not yet available in the commercial marketplace, but will be in time to satisfy the delivery requirements of a Government solicitation

CI/NDI (continued)

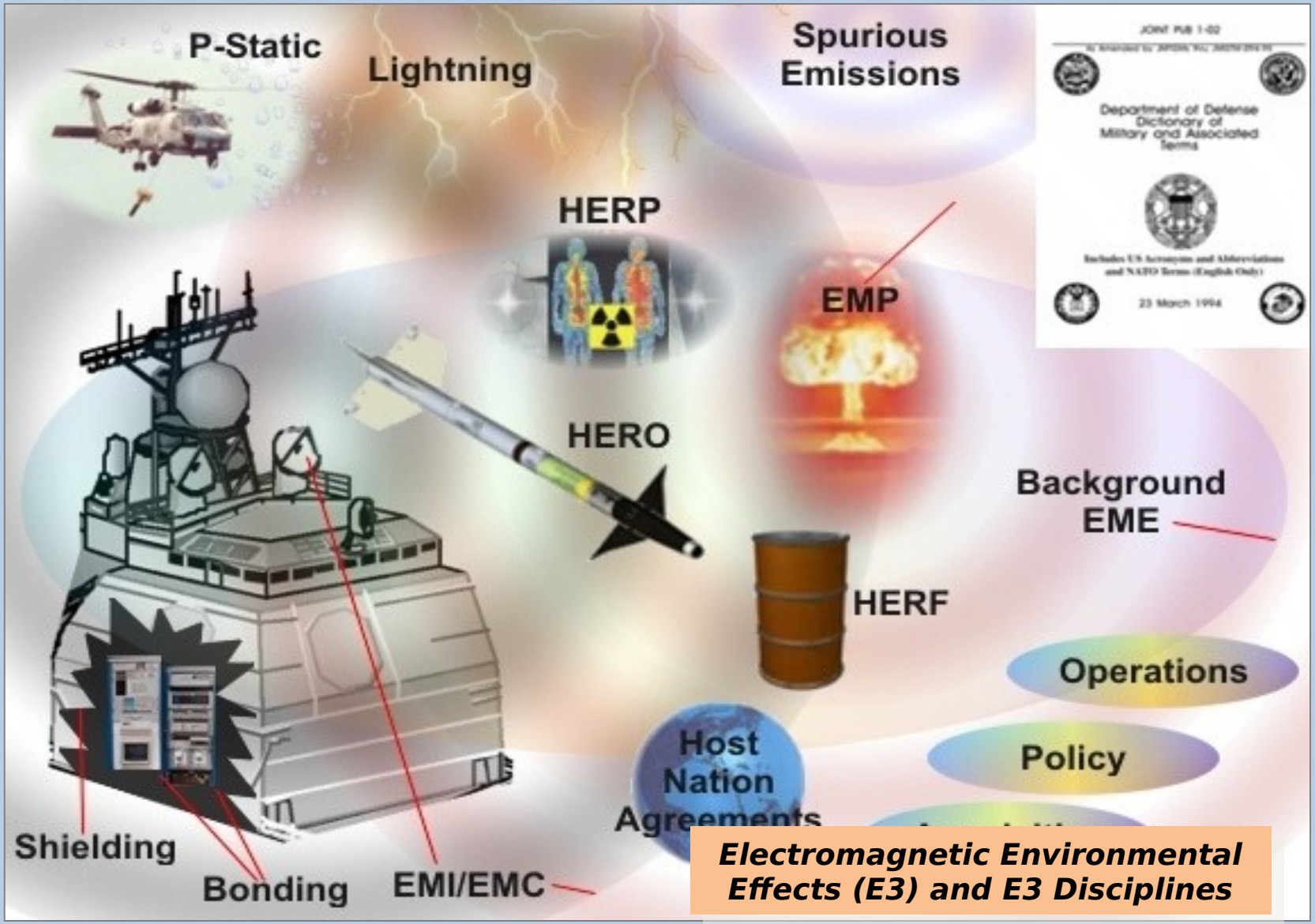
- **Non-Developmental Items (NDI): items previously developed and used by another DoD or Federal Agency**
  - a State or local Government, or
  - foreign Government with U.S. mutual defense agree

Electromagnetic Compatibility (EMC)

The ability of systems, equipment, and devices that utilize the electromagnetic spectrum to *operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation* because of electromagnetic radiation or response. It involves the application of sound electromagnetic spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximize operational effectiveness.

- **Joint Pub 1-02, "Department of Defense Dictionary of Military and Associated Terms," dated 9 May 2005**

Electromagnetic Environmental Effects (E3) and E3 Disciplines



CI/NDI – E3 Concerns

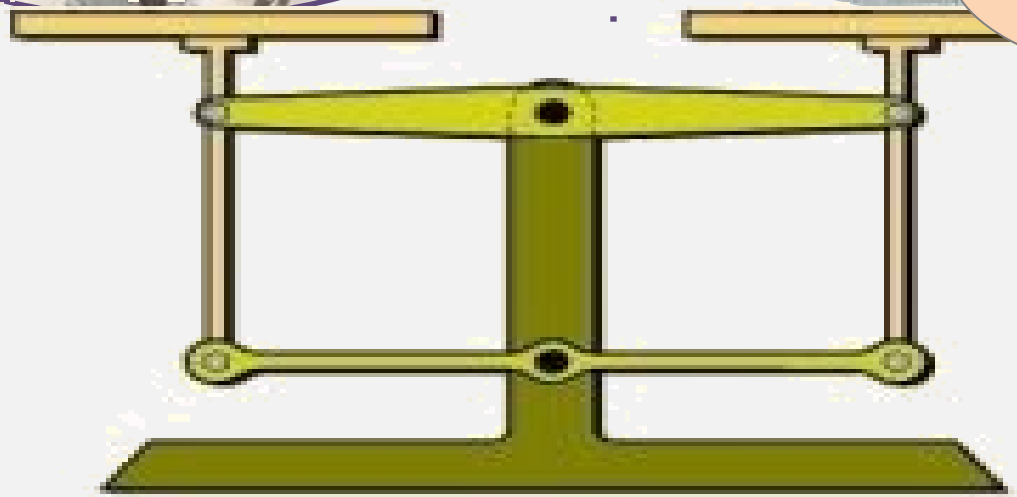
- **CI is not designed to operate in a harsh military EME**
- **NDI may be designed for one EME but might be used in another**
- **Review existing test data, design, intended EME, and required performance to determine suitability**
  - Compare with applicable MIL-STD-461 requirements
  - Perform limited testing to obtain data for comparison
  - Modifications or substitutions may be necessary

DISA Spectrum Supportability (SS)

- Ensure the U.S. warfighter has sufficient spectrum access to support military capabilities
- Pursue spectrum-efficient technologies

- Obtain U.S. Government (USG) certification
- Conduct spectrum supportability risk assessment

Receipt of Equipment Spectrum Certification (DD Form 1494)

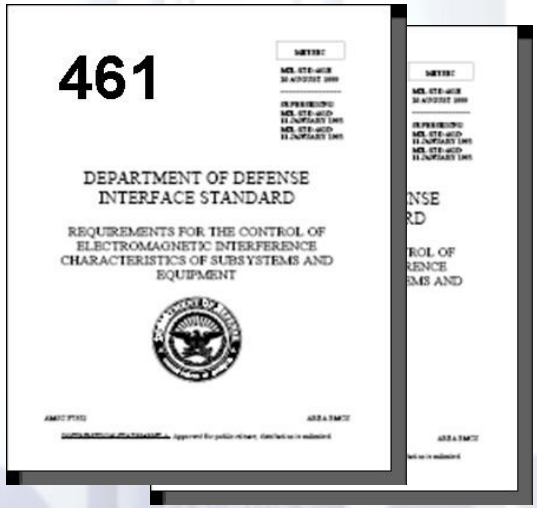


CI/NDI – SS Concerns

- **Military use of CI on commercial frequencies**
- **DD Form 1494 must be submitted to the Service's frequency manager for approval**
- **CI *procured* by the military may be operated only after spectrum support and approval has been granted by the NTIA**
- **Leasing rules different (mainly Satellite Services)**

CI/NDI
Commercial Specifications and Standards

- **No commercial standards equivalent to MIL-STD-461 or MIL-STD-464.**
- **Commercial E3 specifications and standards inadequate for military platforms**
  - Inadequate susceptibility/immunity requirements
  - Frequency concerns differ
- **Determine the minimal military E3 requirements essential for the mission**



CI/NDI

Commercial Specifications and Standards

- **Compare tailored E3 requirements to those used for the CI/NDI being considered for procurement**
- **If there was no commercial EMC testing, test to applicable MIL-STD-461 requirements**
- **See report EPS – 0178 and Appendix E**

EPS-0178 (acc.dau.mil/library)

"Results of Detailed Comparisons of Individual EMC Requirements and Test Procedures Delineated in National Major and International Commercial Standards with MIL-STD-461"

Advantages/Disadvantages of NDI

ADVANTAGES

- Reduced procurement costs
- Reduced or no development time
- Reduced production time
- Expanded industrial base of replacement equipment
- Replacement parts availability worldwide
- Quick response to operation needs
- Application of state-of-the-art technology to current requirements

DISADVANTAGES

- Modification costs
- Downtime due to harsh environment
- Potential performance degradation due to environment (range reduction, increase bit error rate, etc.)
- Increase life cycle costs due to changing market demand or need to investigate/solve operational EMI or other problems which were not considered in design
- Length of time replacement parts are guaranteed

Solutions

- **Education/Training/Awareness**
- **Pre-acquisition Analysis**
  - Determine Potential Operational EME
  - Analyze EMC Characteristics of CI (Commercial Specifications)
  - Determine Potential Problems
  - Test for Compatibility with EME
- **Obtain Spectrum Certification Supportability (Early Submissions of DD Form 1494)**
- **Industry Implementation of Voluntary Standards**

Equipment Life Cycle Spectrum and E3 Concerns

Chip

ESD

Circuit Board

EMC/EMI
ESD

Equipment

EMC/EMI
EMV
HERP
Spectrum
Cert

Suite

EMC/EMI
EMV
HERP
HERO
HERF
Lightning
EMP
P-Static

Platform

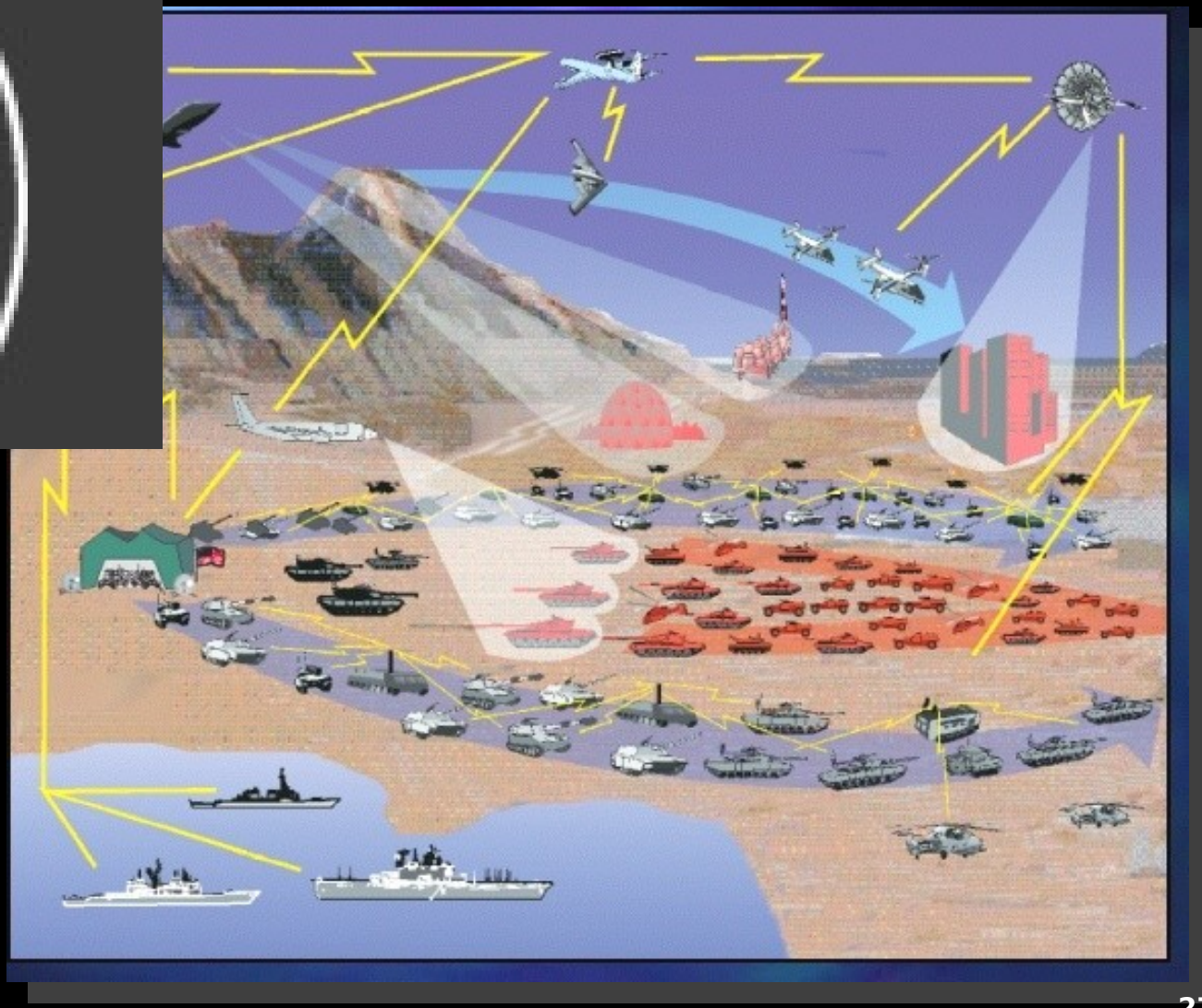
EMC/EMI
EMV
HERP
HERO

Multiple Platforms

EMC/EMI
EMV
HERP
HERO
Frequency
Planning

Today's Complex Battlespace

"In today's complex and electromagnetically dense battlefields… the Commander who controls the electromagnetic spectrum, controls the outcome"…



Importance of E3/SS Management.. ”The Bottom Line”

- **Warfighter Effectiveness/Catastrophic Incidents**
- **Increasing EM Spectrum Demands**
- **CI/NDI Battlefield EME Compatibility Issues**
- **Greater Risk Acceptance**

***THE BOTTOM LINE*:** *We are all responsible for providing the warfighter with systems that will perform their mission in their operational EME*